

IBM Intelligent Operations Center for Smarter Cities

IBM Redbooks Solution Guide

The IBM® Intelligent Operations Center solution integrates and uses data from multiple sources and makes sense of it on a single interface. It simplifies the disarray and multiplication of data sources that are necessary for understanding, yet that are too voluminous for easy consumption. It also provides a single interface to all systems of an enterprise or city to make them usable without being overwhelming.

By taking advantage of the power of advanced analytics, asset management, and collaboration tools, IBM Intelligent Operations Center delivers the ability to gain insight into an environment through centralized information. Figure 1 shows an Operations page from IBM Intelligent Operations Center that pulls together relevant information from various sources into one meaningful view.

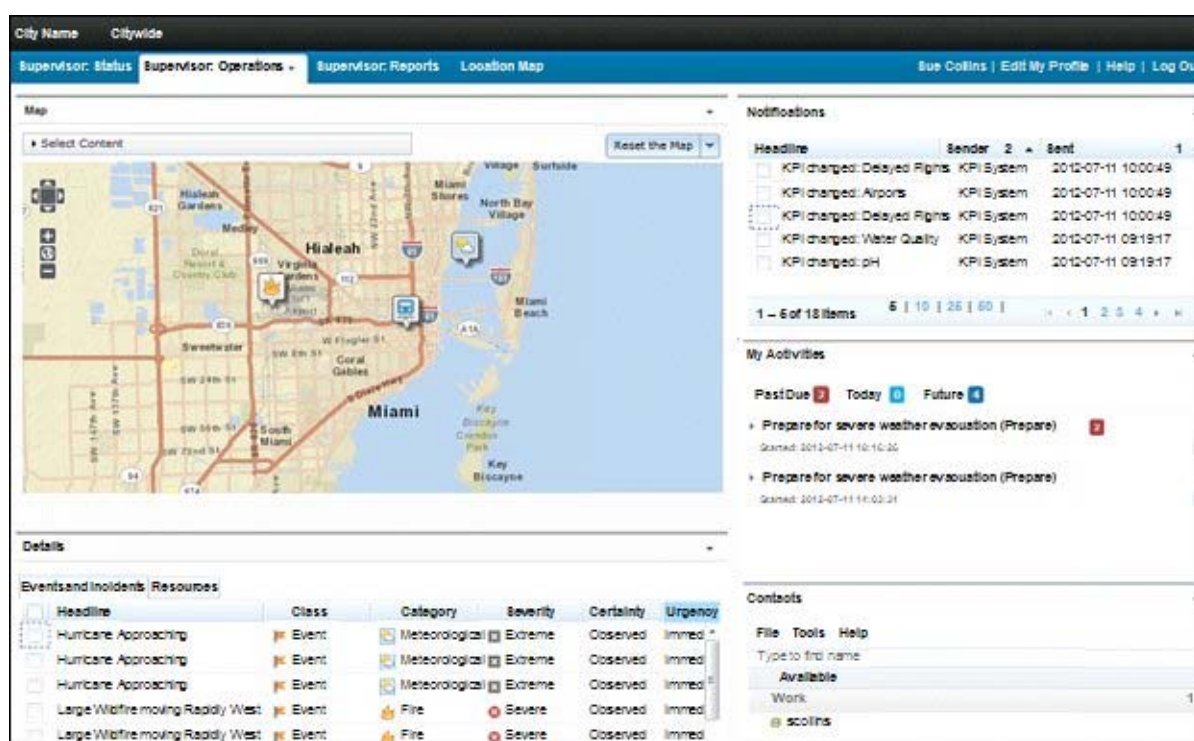


Figure 1. IBM Intelligent Operations Center

Did you know?

Today, most people around the world live in urban areas. In the years to come, the percentage of people who are living in cities will continue to rise with the population. By 2050, two-thirds of the world's population will live in cities.

Citizens and businesses are placing increasing demands on leaders to innovate to progress. People are becoming increasingly more connected through social media, and massive amounts of new data are created every day. As a result, leaders are forced to determine ways to harness and drive insight and actions from the information that they have available to create more value for their citizens, drive sustainability, and enhance the quality of life.

Business value

IBM Intelligent Operations Center provides the following benefits:

- Helps city officials to better monitor and manage city services by providing them insight into daily city operations through centralized management and data intelligence
- Helps city agencies to prepare for problems before they arise and to coordinate and manage problems when they do arise
- Enables officials to communicate instantly and to discuss and synchronize rescue efforts so that they can send the right people and equipment to the right place at the right time
- Facilitates cross-agency decision making, convergence of domains, coordination of events, communication, and collaboration, which improves the quality of services to citizens and reduces expenses
- Automatically flags event conflicts between city agencies
- Optimizes planned and unplanned operations by using a holistic reporting and monitoring approach
- Helps operations executives or staff to adjust systems to achieve results that are based on the insights that are gained

Another major benefit of IBM Intelligent Operations Center is that it aggregates several information feeds and makes sense of them in the context of the person who is viewing them. With this capability, city leaders can quickly assess the overall status of their city or enterprise. They can swiftly identify issues that require attention and coordinate resources to respond to issues rapidly and effectively.

IBM Intelligent Operations Center can recognize events as they arise, promoting them for instantaneous response by necessary parties. It supports creating and executing standard operating procedures (SOPs) in response to these events, maintaining an overall transparency for interested parties to remain informed about the progress in handling events. Having this real-time information about events and SOP responses in place allows for efficient management.

Solution overview

IBM Intelligent Operations Center provides integrated data visualization, real-time collaboration, and deep analytics. It can help leaders to prepare for problems before they arise and to coordinate and manage problems as they occur, improving the efficiency of city operations.

A flexible rules-based data flow directs large quantities of data into a structured format that can be used for reports and key performance indicators (KPIs). IBM Intelligent Operations Center brings events to the surface and alerts action when needed. It also provides a web-based, configurable interface that is specific to the user's role and needs so that everyone in the organization can see and collaborate on the same data in their own way. This ability to collaborate allows synchronization of effort, audit trails, collaboration, and group decision making. It also can help to synchronize and analyze efforts among sectors and agencies as they happen, giving decision makers consolidated information that helps them anticipate, rather than react, to problems.

IBM Intelligent Operations Center delivers the following major functions:

- Visual workspace
- Events and incident management
- Resource, response, and activity management
- Status monitoring
- Collaboration, instant notification, and messaging
- Reports
- Semantic model

The concepts and functions in this section explain how the IBM Intelligent Operations Center solution makes supervision and coordination of complex organizations more effective. Organizations need to unite large amounts of information from multiple sources, filter and analyze the data, and bring insights to the surface to help in decision-making. IBM Intelligent Operations Center helps to evaluate the effectiveness of the decisions and applied procedures and to make improvements.

IBM Intelligent Operations Center helps organizations in the following ways:

- Handle events and alerts, both emergency and non-emergency
- Organize response teams, enabling fast and clear communications between team members
- Define and provide standard operating procedures for handling different situations that arise, with appropriate assignments, based on legal requirements or historical experience
- Track the progress of the performance of those procedures, including the results of the actions
- Locate resources with the required capabilities to handle the events
- Enable the continuous improvement of the organization's services and responses

Visual workspace

The user interface for IBM Intelligent Operations Center is a dashboard that provides insight into data that is customized to a user's role and authority. This flexible view into the wealth of data that flows into, and is stored in IBM Intelligent Operations Center, is at the heart of the solution. Its appearance is configurable and delivers the data that the user wants to see and is allowed to see.

The role-based context is necessary because IBM Intelligent Operations Center provides many avenues to data discovery. From the wealth of data that flows through it, IBM Intelligent Operations Center can customize and display only the information that the viewer needs and that is necessary for their role.

Figure 2 shows an executive dashboard in IBM Intelligent Operations Center. It is also possible to use this visual workspace to bring in other enterprise applications, either having their user interfaces share the display or integrating their data into the data that is used by the Intelligent Operations Center.

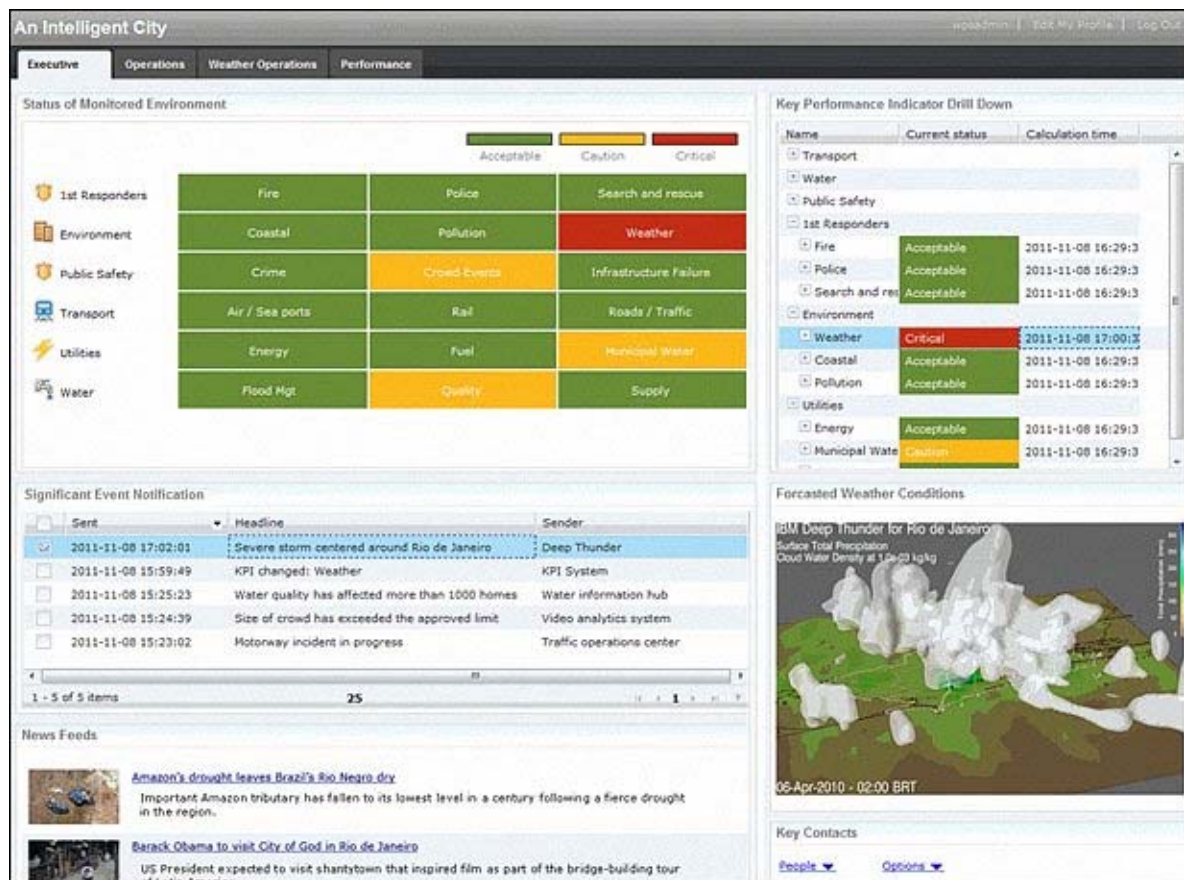


Figure 2. IBM Intelligent Operations Center visual workspace

Events and incident management

A major facet of IBM Intelligent Operations Center is its ability to use event information. Events represent occurrences of important happenings across the management domain that are represented by IBM Intelligent Operations Center. Events are presented appropriately to the user based on their role. Executives might view events as roll-ups or KPIs. Operators might see events in a list or on a map, and can respond to them based on their displayed urgency.

Events usually have temporal (point or span of time and physical (geospatial) location) attributes and a type. For example, a water main break at a particular street intersection would qualify as an event.

Events can also be things that you expect to happen in the future. Future events are useful for coordination purposes. For example, multiple city agencies might plan road work for the same section of a road at slightly different times. IBM Intelligent Operations Center can correlate the events and enable collaboration so that the city digs up the road only once instead of multiple times.

IBM Intelligent Operations Center provides an event reporting and tracking mechanism to enable identification and understanding across underlying domains. You can manage predicted events, planned events, and current events as they evolve. For example, replacing pipes that run under a road is a planned event or work order that involves water and traffic operations, and possibly other operations such

as cable or electric. Inclement weather that is due to arrive in the next 24 hours is a predicted event. A traffic jam is a current event that is affected by both road work and weather. By managing all these types of events in one place, it is possible to improve response, reduce extra work, prepare more efficiently, and maintain a fully informed perspective of the current and future state of the enterprise.

An integrated geographic information system or location plan maps events visually, so that you can perform visual correlation, see patterns, and gauge the effect of events through interactive mapping and scenario analysis. Figure 3 shows geospatial mapping of events and an events list with details about the events.

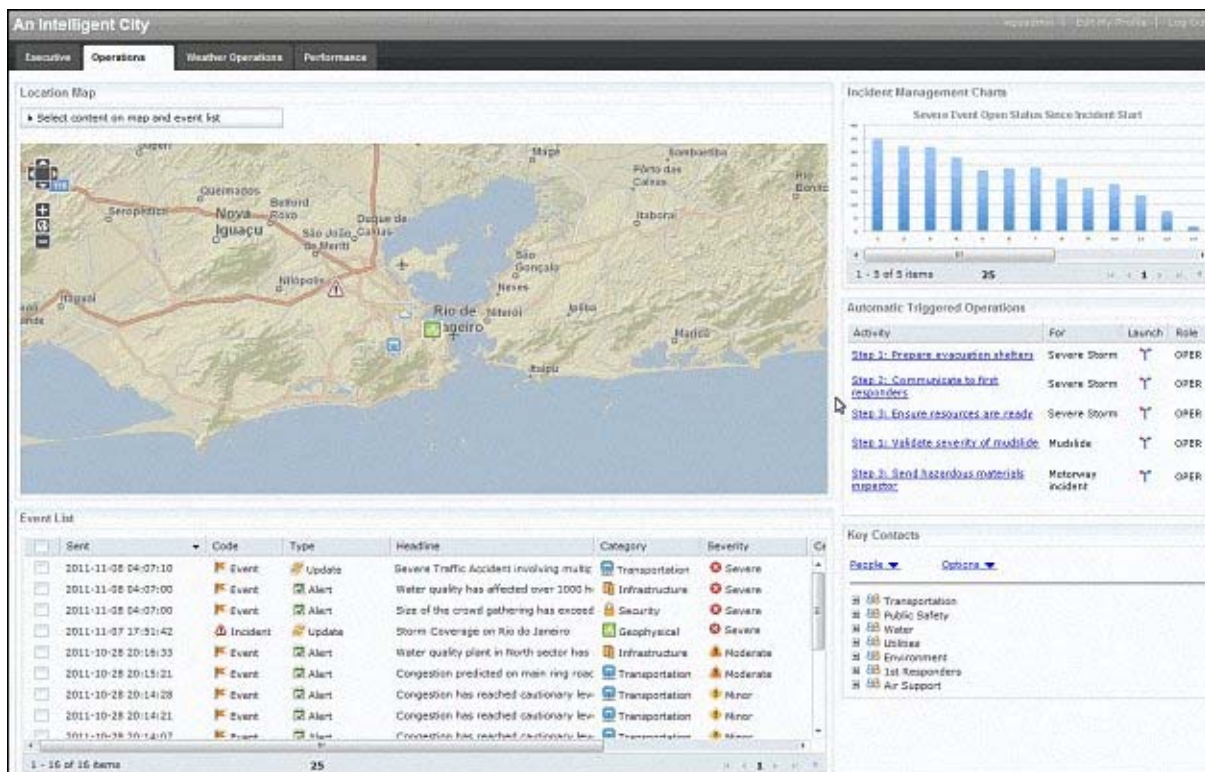


Figure 3. Geospatial and detailed representation of events

Resource, response, and activity management

IBM Intelligent Operations Center provides a system for storing appropriate procedures and workflows. They are based on activities that are associated with events. After IBM Intelligent Operations Center recognizes an event, it can choose several different actions to mediate or manage the event. Typically, a first action involves escalating the event to an incident. The operator might first consult SOPs and communicate with local teams through collaboration tools that are provided by IBM Intelligent Operations Center.

Standard operating procedures are predefined instructions for dealing with events or situations that a city can anticipate and plan for. SOPs can be reduced programmatically to a series of steps and actions. Some SOPs can be automated, and some require a human to make a decision.

An incident is flagged as something that requires special attention and handling. After an event is escalated to an incident, a workflow or other predefined series of actions begins in accordance with an SOP. You can track the progress of workflows and monitor or update the status of activities that are assigned to you. Information about a range of available resources can be highlighted on a map. The information is easy to access when and where you need it.

Figure 4 shows a list of events in the operator's dashboard and the actions that are associated with each event. For example, when you view the standard operating procedures, you can find the nearby resources and their capabilities, escalate the event to an incident, and more.

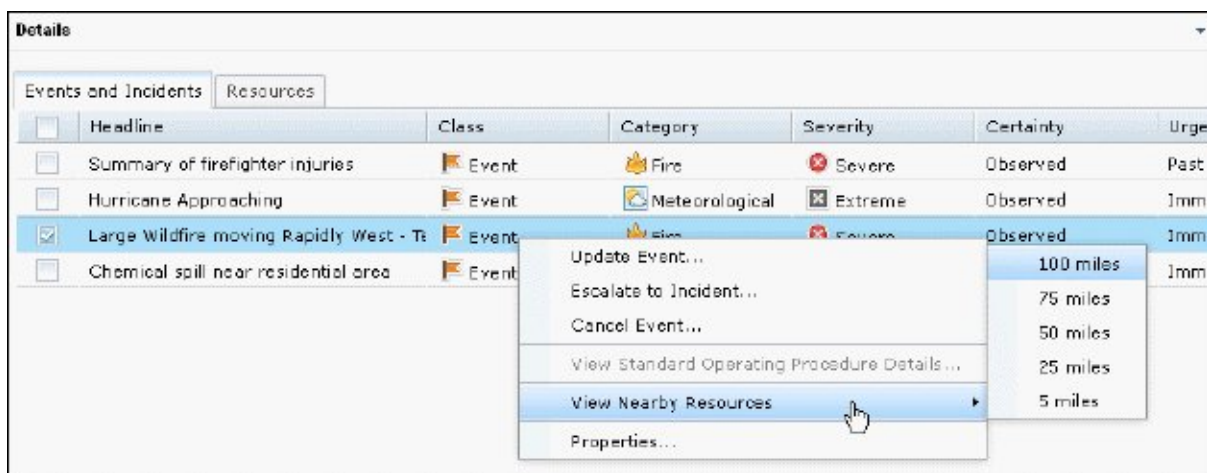


Figure 4. Event details and operator actions

Status monitoring

IBM Intelligent Operations Center can help to tailor and define KPIs. KPIs are updated as underlying data changes. Through this function, users of IBM Intelligent Operations Center can perform the following actions:

- Summarize the executive-level status for a single domain or across domains
- Highlight issues and identify problems
- Investigate further by drilling down into the KPI details

KPIs are used to measure nearly anything of importance to city leaders, from the number of traffic accidents this calendar quarter to the on-time performance of the public transportation system. IBM Intelligent Operations Center receives raw or computed metrics and uses them to compute the actual KPI.

For example, for bus performance, the metrics might indicate, for each bus, whether it is ahead of schedule, on time, or behind schedule. When rolled up with all the other bus information, it might compute to a single metric that indicates whether, on average, the buses are on schedule. City bus administrators can rest easy if they see, at one glance, that the average bus arrival is green. This status probably means that, on average, buses are arriving at approximately their scheduled times. If this KPI turns yellow or red, the administrator can determine the cause and act appropriately.

Because of the hierarchical nature of KPIs, users of IBM Intelligent Operations Center can uncover and act upon the underlying cause of the KPI change. IBM Intelligent Operations Center provides the simplicity of an overreaching and comprehensive dashboard, in addition to the necessary underlying detail to determine a cause and enact appropriate remediation.

Collaboration, instant notification, and messaging

IBM Intelligent Operations Center provides a workspace where users can maintain alerts for matters that need attention. They can use this workspace to monitor news and events, especially when other portlets that announce news are not in view.

An integrated collaboration and communication tool is also provided for messaging and communication among users where and when it is needed.

Reports

IBM Intelligent Operations Center has an integrated reporting facility to set up and run reports with the events and KPIs that are supplied by the solution. This facility collects and presents the most useful information on an up-to-the-minute and regular basis. It also provides all the advantages of tailored summaries and graphical presentation.

IBM Intelligent Operations Center comes with a reports page that can display up to six reports. Administrators can also create a reports page manually and customize the portlet layout. The reporting subsystem uses an analytic data model. Reports can be created based on historical data that is exposed by business intelligence and analytics. Users can create ad hoc reports and reusable reports. Reusable reports can be assembled easily by using drag-and-drop technology. They can be created into components that can be visually displayed in the IBM Intelligent Operations Center dashboard.

Figure 5 shows examples of reports that are built with the IBM Intelligent Operations Center reporting facility.



Figure 5. Reports and data analysis

Semantic model

IBM Intelligent Operations Center incorporates a hidden jewel that is known as the *model manager*. This component allows for the complex modeling of relationships in a city or enterprise between its devices, equipment, buildings, and their relationship to each other and to less palpable items, such as maintenance records, failure history, composition, and cost. This modeling and association between all the parts of a city and its processes allows for complex analysis and optimization at reduced cost and with greater ease.

As complexity increases in cities and enterprises overall, as companies acquire other companies, and as utilities bring in more data sources, the need for an overarching model that can federate databases and create a single point of reference becomes essential. By using the reference semantic model capability that is built into IBM Intelligent Operations Center, increasingly complex organizations can create overarching models that simplify processes, analysis, and access to relevant data.

Solution architecture

Figure 6 provides an overview of the IBM Intelligent Operations Center architecture.

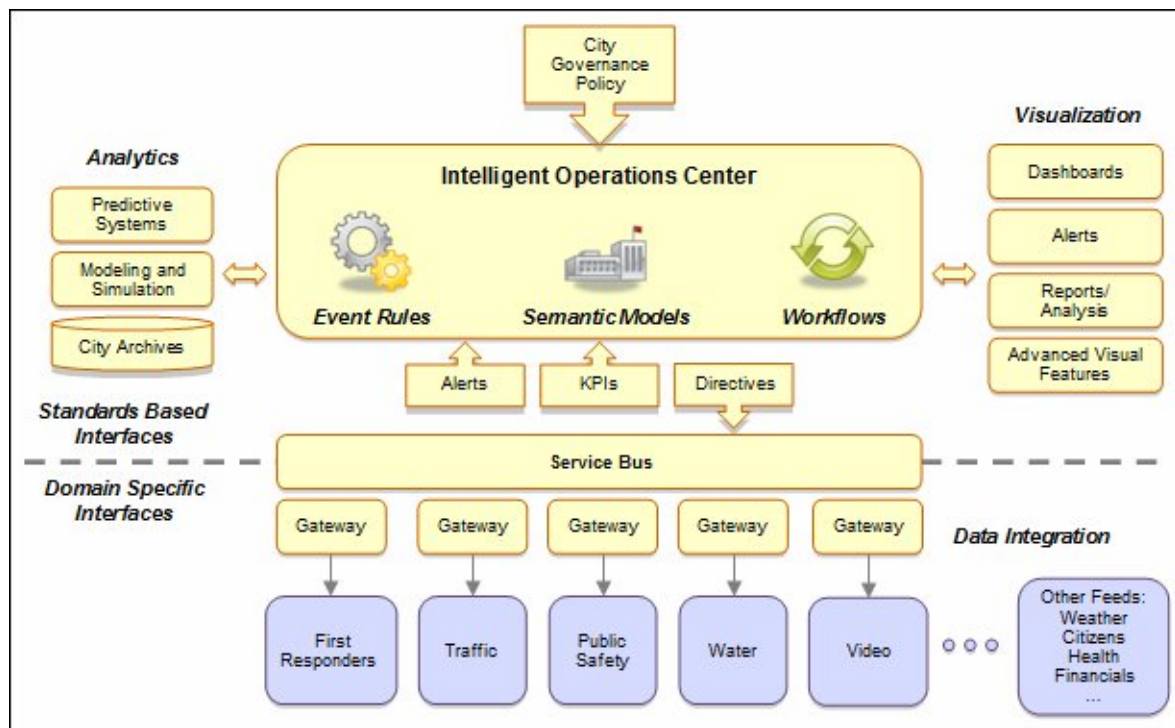


Figure 6. IBM Intelligent Operations Center architecture

Data from various configurable sources is received through different means (directly by using XML standards-based exchange formats or through adapters) into an enterprise service bus (ESB) and world-class message queueing system. This system can forward events, alerts, notifications, KPI metrics, and initiate directives.

The IBM Intelligent Operations Center architecture has the following components:

- The *enterprise service bus* handles internal and external messages. It provides a loosely coupled interface for exchanging data and operations in a service-oriented architecture.
- The *event manager* handles anything that comes into the system and interacts with the service bus to ensure appropriate treatment of incoming data. The event manager interrogates every incoming piece of data and performs correlations, storage, and other activities as prescribed by the user. This flexible system can be used to apply business rules and logic to all incoming data, allowing fluid control and immediate response to critical information.
- The *KPI manager* watches all incoming data that is routed to it to continually update the KPI dashboard in accordance with user preferences. KPIs are typically viewed on the executive dashboard and allow a quick and thorough top-level status of all key processes. KPIs are tunable and can reflect, for example, the status of aggregated data, roll-up data, current versus historic performance, and expenditures versus revenue. Drill down from the executive dashboard is also possible to ascertain the specific cause of a KPI changing status or color.
- The *workflows engine* helps to automate and track standard operating procedures in order to kickstart response to incidents automatically in accordance with specified policy. They also afford consistency and auditability of responses and help to coordinate response among many stakeholders.
- IBM Intelligent Operations Center is a configurable role-based interface that allows authenticated users to see the huge array of information that is available to them in the manner that they find the most useful and actionable. Maps, lists, reports, and other views are user-configurable so that the users see what they want to see and what they are allowed to see. Integration of outside sources of data is possible, such as video and social media.
- The *semantic model* provides an unparalleled ability to model objects in an enterprise or city and the relationships between them. This representation and the flexible ability to traverse the relationships between equipment, processes, and materials makes possible the complex analysis of the effect of device status changes on processes and cash flow and revenue, for example. Semantic models can create a holistic model of multiple systems of hardware and their interrelationship, in addition to their effect on business processes and non-device issues.

IBM Intelligent Operations Center takes full advantage of this capability, to provide a simplified view of a complex world, and analytical capabilities that can use this view to bring unique insight. Advanced analytics can analyze the data, identifying optimizations and predictions that can help guide decisions and develop policies.

Other systems can be integrated with the solution. Customization can be done at several common integration points, which provides consistency. By using these integration points and the included infrastructure services, IBM Business Partners and independent software vendors (ISVs) have the flexibility to build a powerful, broad solution that is tailored to client-specific needs.

Usage scenarios

Solutions that are based on IBM Intelligent Operations Center expand a broad range of industries and organizations. Several use cases apply to water management, public safety, transportation, social programs, entertainment venues, buildings, energy, and more.

Advanced emergency response system

In this scenario, IBM Intelligent Operations Center is used to build a city's advanced emergency response system. The city's operations center integrates information and processes from many city agencies into a single operations center that provides a holistic view of how the city is functioning on a 24 x 7 basis.

In this case, a city wants to improve its safety and responsiveness to various incidents, such as flash floods and landslides. The solution is to create an automated alert system that notifies city officials and emergency personnel when changes occur in the flood and landslide forecast for the city, based on predefined thresholds. Contrary to previous systems in which notifications were manually relayed, the new alert system is expected to drastically reduce the reaction times to emergency situations. It uses instantaneous mobile communications, including automated email notifications and instant messaging, to reach emergency personnel and citizens.

The emergency management solution, which is based on IBM Intelligent Operations Center, offers the following advantages:

- Integrates information from across agencies and systems
- Provides a dashboard to manage and visualize workflows
- Facilitates cross agency decision making and collaboration
- Optimizes intra-agency resource and task scheduling
- Automatically flags event conflicts between city agencies
- Efficiently controls and uses cross-agency resources, reducing the time to resolution of emergency and crisis situations

The emergency response system, which is based on IBM Intelligent Operations Center, has the following benefits:

- Helps to save lives by enabling city officials to react and respond to disasters faster and more efficiently.
- Maximizes efficiency and improves service levels that are provided to citizens.

Wastewater management

With the IBM Intelligent Operations Center acting as the central point of command, the solution collects, analyzes, and monitors live data from sensors and level indicators in the sewer system. It also helps control wet weather flow through the remote use of wireless sensors, smart valves and ballasts, or inflatable bands.

A city's department of water works utility maintains a complex system of water mains, water meters, filtration plants, well fields, and water storage facilities. The system uses a combined sewer overflow model in which one large pipe carries all waste water, storm water, sanitary sewage, and other pollutants to the water treatment plants. In a heavy rainstorm, the city's aging infrastructure could not handle the large volumes of rainwater and waste water. The resulting overflow of raw sewage never reached the treatment plants and, instead, was released directly into the river, posing significant health and property risks.

City officials were looking for a way to solve this problem, but to further extend and use the water system's existing data and sensor technology. They were looking for a more sophisticated and intelligent alternative to digging up the city's streets and rebuilding virtually the entire water works infrastructure.

A solution that is based on IBM Intelligent Operations Center collects information from sensors that are placed in the sewer system. These sensors proactively monitor and alert the city water authority when water is rising to dangerous levels or a blockage occurs. This sensor data can then be used to create a dashboard with geospatial mapping, showing precise "hotspots" where a risk of sewage overflow is greatest.

The solution has the following key features and capabilities:

- Overlay mapping of key data values for at-a-glance status
- Collection system for wastewater levels and pumping station operation
- Collection of trending and historical data from water and wastewater operations for planning
- Basement backup heat map
- Calculation of combined sewer overflow volumes from supervisory control and data acquisition (SCADA) collection system wastewater levels
- System-level and geographic information system view of cross-silo SCADA components

The solution relies on data that is collected by sensors and integration of software that is provided by IBM Business Partners. This integration is possible thanks to IBM Intelligent Operations Center architecture and defined common integration points.

By implementing this solution, the city can make proactive decisions, and initiate and monitor predefined action plans to alleviate or manage a flood threat. City operators can take proactive measures, such as deploying a crew to repair a sewer line; call in fire, police, or rescue personnel; or send an urgent alert to citizens to prevent public health disasters before they occur.

The solution helps the city to attain real business results:

- Cut wet weather overflows and dry weather overflows
- Gain millions of gallons of capacity in its water system
- Avoid millions of dollars in infrastructure investments plus more in potential government fines

In addition to collecting and aggregating data to deliver a unified view of the combined sewer overflow infrastructure, the solution employs sophisticated analytics and monitoring capabilities that help the city predict where sewage overflow is likely to occur.

Entertainment venue operations center

This scenario focuses on an entertainment venue that must manage a continuing series of events. The venue might represent a sports complex or stadium, cruise ship, theater, or concert hall. The events can range from a regular schedule of games, shows, concerts, or a combination of events.

A major goal of entertainment venues is to improve the overall customer experience, such as getting to the stadium, ease of parking, waiting in lines, and the quality of the entertainment itself. Improving the entry and exit flow from the event is an important part of the customer satisfaction.

The IBM Intelligent Operations Center solution provides a complete interconnected view of stadium activity. This view might include weather alerts, real-time security, and traffic flow into the stadium that creates a seamless flow of visitors that are attending a game. This view might also include insights into whether visitors prefer a full dining experience or buy food at concession stands before a big game. In addition, with advanced crowd control management that uses geospatial intelligence and audiovisual notifications, security personnel can immediately shift the flow of fans to minimize crowding.

By using IBM Intelligent Operations Center, stadium staff can now offer a unique fan experience. Event specialists can more effectively manage visitor traffic, monitor inclement weather, and analyze visitor

spending habits on concessions, merchandise, and dining services, to better target the fans with premium products and services. Also, by using real-time analysis, staff can predict consumer preferences and plan concession and merchandise needs for current or future events. For example, concession and dining service sales contribute a significant amount of revenue for a stadium. Therefore, anticipating a fan's preference for a full dining experience or purchasing food at a concession stand during an event is key to increasing business profitability.

Supported platforms

IBM Intelligent Operations Center can be deployed within a city's data center (on-premises) and is available through a subscription service that is hosted on the IBM SmartCloud™.

For city managers that prefer a subscription service model that does not require additional hardware or IT management capacity, IBM Intelligent Operations Center on IBM SmartCloud is an ideal solution. This service provides rapid and secure Internet access to the capabilities of the IBM Intelligent Operations Center on an IBM Cloud. This way, cities can rapidly adopt new capabilities and can control costs. For more information, see IBM Smarter City Solution on Cloud at:
<http://www.ibm.com/software/industry/smartercities-on-cloud>

For on-premises deployments, IBM Intelligent Operations Center requires five 64-bit x86 servers. Red Hat Enterprise Linux Version 5, Update 5, or later must be installed on all servers. For information about minimum hardware requirements, see the "IBM Intelligent Operations Center hardware requirements" topic in the IBM Intelligent Operations Center Information Center at:
http://pic.dhe.ibm.com/infocenter/cities/v1r5m0/topic/com.ibm.ioc.doc/ba_plan_hardware_lite.html

Ordering information

IBM Intelligent Operations Center is available only through IBM Passport Advantage®. It is not available as a shrink wrapped product. This product has the following ordering details:

- Product Group: Smarter Physical Infrastructure
- Product identifier: 5725-D69
- Product identifier description: IBM Intelligent Operations Center
- Product Category: IBM Smarter Cities®
- Charge metric: User Value Unit (UVU)

Related information

For more information about IBM Intelligent Operations Center, see the following documents:

- IBM Intelligent Operations Center V1.5 sales manual
<http://ibm.co/UsdPRG>
- IBM Intelligent Operations Center V1.5 announcement letter
<http://ibm.co/SxEr3P>
- IBM Intelligent Operations Center Product page
<http://www.ibm.com/software/industry/intelligent-oper-center>
- IBM Intelligent Operations Center Information Center
<http://pic.dhe.ibm.com/infocenter/cities/v1r5m0/index.jsp>
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<http://ibm.co/WHvkVm>
- *IBM Intelligent Operations Center for Smarter Cities Administration Guide*, SG24-8061
<http://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/sg248061.html?Open>
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